

A REVISION OF THE GENUS *PICKFORDIATEUTHIS* VOSS, 1953 (CEPHALOPODA; MYOPSIDA)

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ABSTRACT

A new species of myopsid squid, *Pickfordiateuthis vossi*, is described from the tropical eastern Pacific. This new species is characterized by its highly modified tentacles, the lack of chromatophores on the visceral membrane and the ancestral Type I loliginid hectocotylus. An additional species of *Pickfordiateuthis* species A is described and illustrated, but is not named. The family Pickfordiateuthidae is placed in the family Loliginidae as a junior synonym and the genus *Pickfordiateuthis* is revised. A key to the species of *Pickfordiateuthis* is provided.

In 1986, while sorting through the unidentified cephalopod collection in the Marine Invertebrate Museum, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami, Florida (UMML), I found an unusual little squid from the tropical waters of the east Pacific. The following year, while examining the myopsids in the S. S. Berry collections at the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM), I located 16 additional specimens from the same geographic area. Detailed examination showed that these small but mature specimens represent a new species in the genus *Pickfordiateuthis* Voss, 1953. The distinguishing characteristics of this new species from the eastern Pacific and of specimens of a new unnamed species from the southern Caribbean necessitated the following revision of the genus and re-evaluation of the family Pickfordiateuthidae.

All measurements and indices are as defined by Roper and Voss (1983). When ranges of measurements are given, the median figure in bold face is the mean.

Family Loliginidae (Lesueur, 1821)

Loligoidea (in part) Lesueur, 1821: 89.

Loligidae d'Orbigny, 1845: 297;—Gray, 1849: 36.

Loligineae Steenstrup, 1861: 69;—Jatta, 1896: 165.

Loliginidae Tryon, 1879: 105;—Verrill, 1882: 341;—Naef, 1912: 243;—Naef, 1921/23: 168;—Sasaki, 1929: 105;—Thiele, 1935: 958;—Voss, 1952: 8;—Fields, 1965: 7;—LaRoe, 1967: 16;—Toll, 1982: 19;—Brakoniecki, 1986: 74;—Hess, 1987: 184.

Pickfordiateuthidae Voss, 1953: 602;—Voss, 1956: 107;—Toll, 1982: 49;—Brakoniecki, 1986: 117;—Hess, 1987: 178.

Description.—Eye chamber entirely covered by a transparent corneal membrane, with a minute pore anteriorly. Mantle variable in shape from short and stout to long and slender. Fins rounded or rhomboidal, attached dorsally and connected posteriorly, except in *Pickfordiateuthis*. Buccal membrane with seven lobes. Left ventral arm hectocotylized, except in *Lolliguncula argus* in which the right ventral arm is hectocotylized. Arms and clubs with suckers, hooks are never present. Manus of tentacular clubs with 4 rows of suckers, except in *Pickfordiateuthis*. The funnel locking apparatus is simple and straight. Photophores present on the ink sac in some Indo-West Pacific species.

Genus *Pickfordiateuthis* Voss, 1953

Pickfordiateuthis Voss, 1953: 602;—Voss, 1956: 107;—Toll, 1982: 49;—Brakoniecki, 1986: 117;—Hess, 1987: 178.

Description.—Mantle short, bluntly pointed posteriorly; fins large, elliptical to round, not connected posteriorly, sepiolid-like; buccal membrane lacking suckers; spermatophore receptacle on buccal membrane ventral to beak. Photophores absent.

Pickfordiateuthis pulchella Voss, 1953
Figures 1–3, 4 A, B

Pickfordiateuthis pulchella Voss, 1953: 602;—Voss, 1956: 107;—Zuev and Nesis, 1971: 120;—Nesis, 1982: 148;—Toll, 1982: 49;—Brakoniecki, 1986, 117;—Hess, 1987: 178;—Moolenbeek, 1985, 104.

Material Examined.—Paratypes: 1 Male, ML 14.9 mm, Key West, Florida, November 1949, UMML 31.53; 1 Female, ML 14.0 mm, Crandon Park, Key Biscayne, Florida, February 1950, UMML 31.1208. *Other Material*.—1 Female, ML 21.9 mm, R/V GALE, 25°28'N, 80°14'W, 2 February 1983, UMML 31.1948; 1 Female, ML 14.4 mm, R/V PILLSBURY Sta 1334, 12°18'N, 83°16'W, 28 January 1971, depth 17 meters, UMML 31.856; 1 Female, ML 21.8 mm, R/V GALE, 25°40'N, 80°16'W, 9 April 1982, UMML 31.1947; 1 Female, ML 19.8 mm, R/V GALE, 25°30'N, 80°15'W, 5 May 1982, UMML 31.2551; 1 Female, ML 18.6 mm, R/V GALE, 25°53'N, 80°08'W, 10 October 1982, UMML 31.1952; 1 Female, ML 14.0 mm, R/V GALE, 25°53'N, 80°08'W, 29 October 1982, UMML 31.1953; 1 Female, ML 20.0 mm, R/V GALE, 25°34'N, 80°12'W, 16 May 1982, UMML 31.1950; 2 Females, ML 13.3–20.0 mm, Key Biscayne, Florida, 23 April 1966, UMML 31.515; 1 Female, ML 8.7 mm, 18°15'N, 62°55'W, 22 July 1969, UMML 31.893; 1 Female, ML 11.4 mm, Key Biscayne, Florida, 5 February 1957, UMML 31.1227; 2 Females, ML 9.7–12.1 mm, R/V PILLSBURY Sta 1218, 17°38'N, 77°13'W, 6 July 1970, depth 21.9 m, UMML 31.1784; 1 Male, ML 12.4 mm, 1 Female, ML 11.2 mm, R/V PILLSBURY Sta 1222, 17°47'N, 77°31'W, 6 July 1970, depth 12.8 m, UMML 31.1785; 1 Female, ML 10.5 mm, R/V PILLSBURY Sta 435, 9°8.5'N, 77°2'W, 20 July 1966, depth 36.6 m, UMML 31.623; 1 Male, ML 15.2 mm, R/V GALE, 25°40'N, 80°13'W, 17 May 1982, UMML 31.1949; 1 Male, ML 12.6 mm, Little Conch Key, Florida, 29 December 1962, UMML 31.484.

Description.—The mantle is short, cylindrical and bluntly pointed posteriorly (Fig. 1A). Females are generally larger than males at maturity (ML, males 12.4–13.8–15.2 mm, females 9.7–15.2–21.9 mm). Mantle width is about $\frac{1}{3}$ to $\frac{1}{2}$ of the mantle length (MWI, males 34.2–40.1–46.0, females 39.3–44.3–59.0). The anterior margin is slightly flared, with a median, broad, pointed, dorsal lappet. The ventral margin is deeply indented ventral to the funnel.

Fins large, elliptical in adults, more round in immature specimens, their length less than $\frac{1}{2}$ and their width about $\frac{3}{4}$ of the mantle length (FLI, males 34.9–44.5–51.6, females 37.1–46.2–56.2, FWI males 69.1–78.0–92.9, females 61.7–78.8–99.0). The posterior lobes of the fins seldom extend beyond the posterior end of the mantle and are not united posteriorly.

Visceral membrane covered with numerous chromatophores (Fig. 2).

Head width less than $\frac{1}{2}$ of mantle length, and is slightly narrower in females than in males (HWI, males 37.6–45.0–54.8, females 35.4–42.9–61.0). The funnel is short and stout. The funnel locking apparatus is simple and straight. The funnel organ has an inverted, U-shaped dorsal pad with narrow lateral arms and a small, round, anterior apical papilla. The paired ventral pads are oval (Fig. 3D).

The buccal membrane has greatly reduced lobes, with 7 poorly developed supports, and no suckers. In females, spermatophores are implanted on a thickened spermatophore receptacle, which is found on the ventral portion of the buccal membrane.

Spermatophores are small and thin, less than 2 mm in length (Fig. 4A). The cement body is stout, occupying about $\frac{1}{4}$ of the spermatophore length. As noted by Hess (1987), the spiral filament is not as well developed as that of other myopsids. The sperm mass occupies more than $\frac{1}{2}$ of the spermatophore length. An unusual swelling occurs in the posterior portion of the sperm mass. The func-

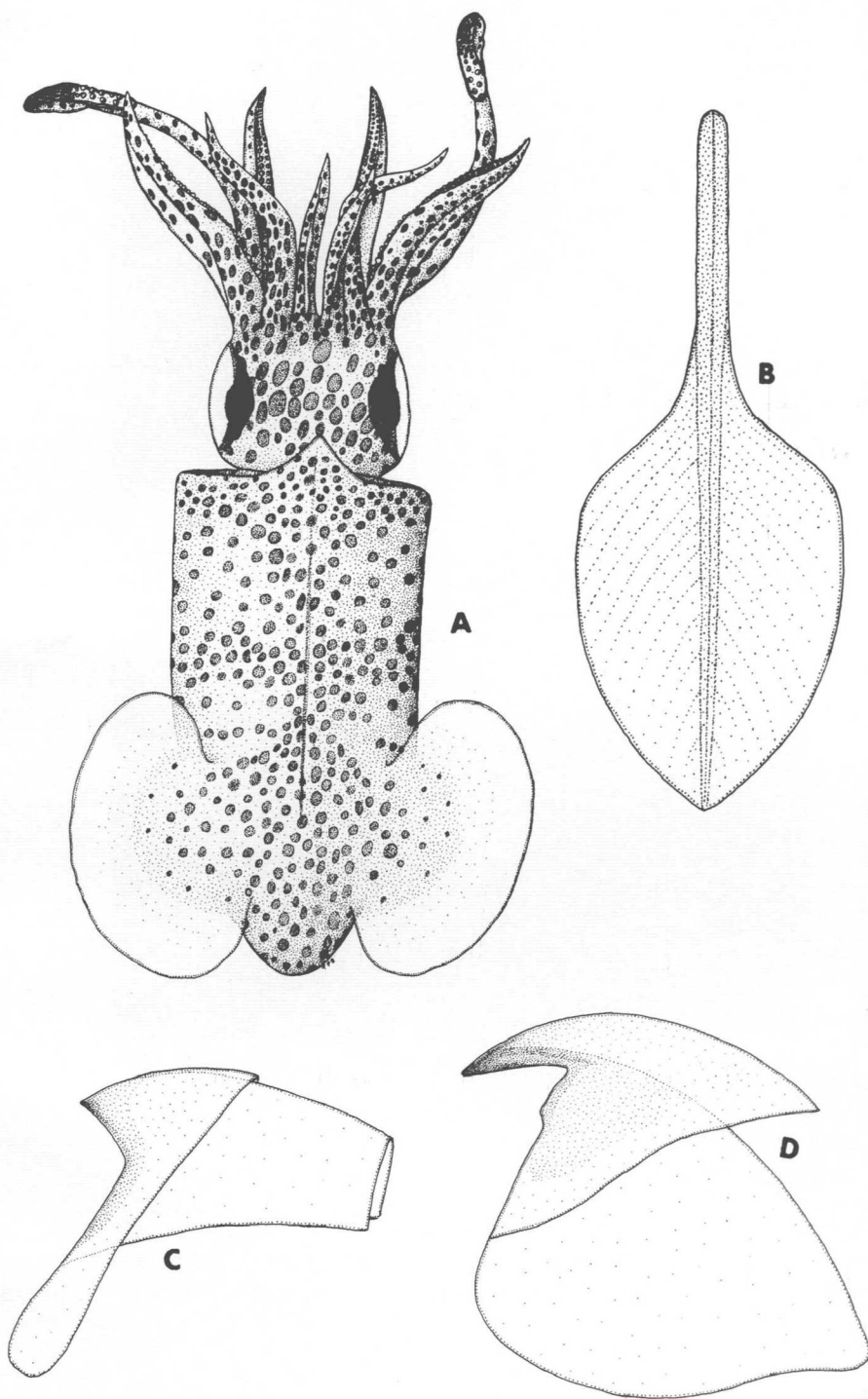


Figure 1. *Pickfordiateuthis pulchella*. A, dorsal view of female, ML 21.8 mm, UMML 31.1947; B, gladius (after Toll, 1982); C, D, lower and upper beaks from female, ML 19.8 mm, UMML 31.2251.

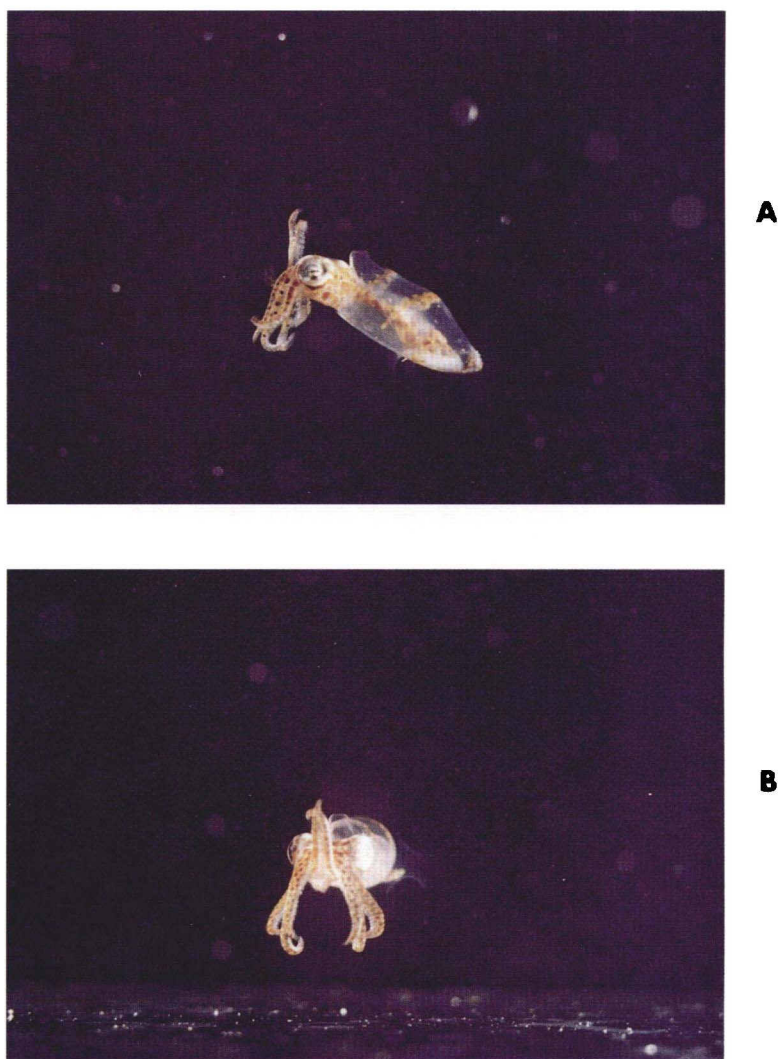


Figure 2. *Pickfordiateuthis pulchella*. Photographs of a live specimen from the files of G. L. Voss. A, side view; B, front view.

tion of this swelling, seen in all fully intact spermatophores examined, is unknown.

The arms are short, stout, and in the order $\text{III.IV} \geq \text{II.I}$. Dorsal and ventral protective membranes border the sucker rows of all arms. Suckers are small and biserially arranged. The sucker rings have few if any teeth. In some of the larger specimens, 2 or 3 short, blunt teeth can sometimes be found on the largest suckers, but most arm suckers appear to lack teeth (Fig. 3). In mature males, the proximal suckers on right arm IV are enlarged.

Tentacles are moderately long and stout. The clubs are compact and bordered dorsally by a swimming membrane. There is no distinguishable carpus. The manus of the clubs has 2 rows of suckers changing distally to 4 rows on the dactylus (Fig. 3E). The dactylus is moderately long, approximately equal to the length of

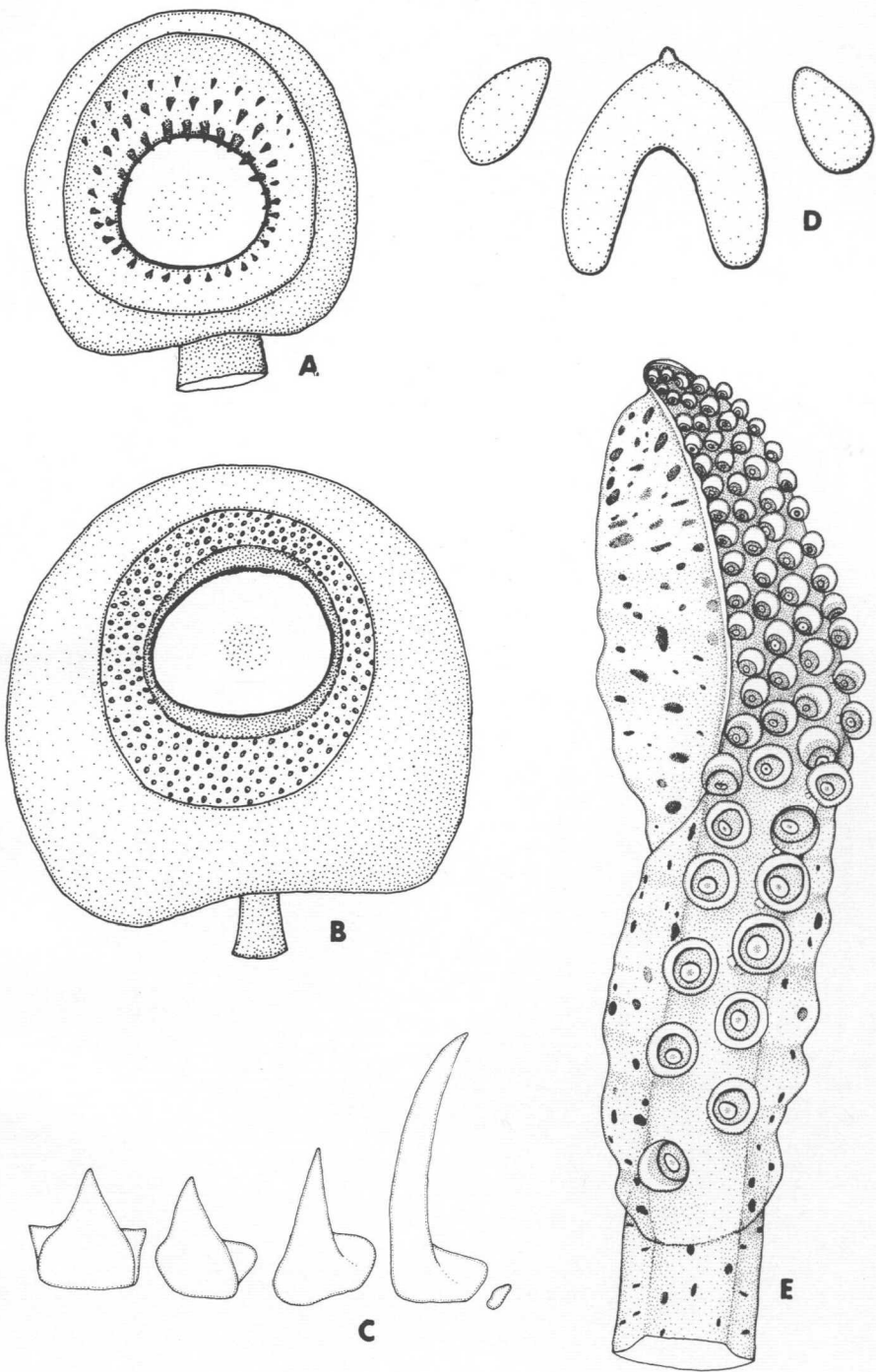


Figure 3. *Pickfordiateuthis pulchella*. A, large tentacular sucker from female, ML 19.8 mm, UMML 31.2551; B, sucker from right arm III, row 5 of same; C, radula from female, ML 20.0 mm, UMML 31.515; D, funnel organ from female, ML 19.8 mm, UMML 31.2551; E, tentacular club from female, ML 21.8 mm, UMML 31.1947.

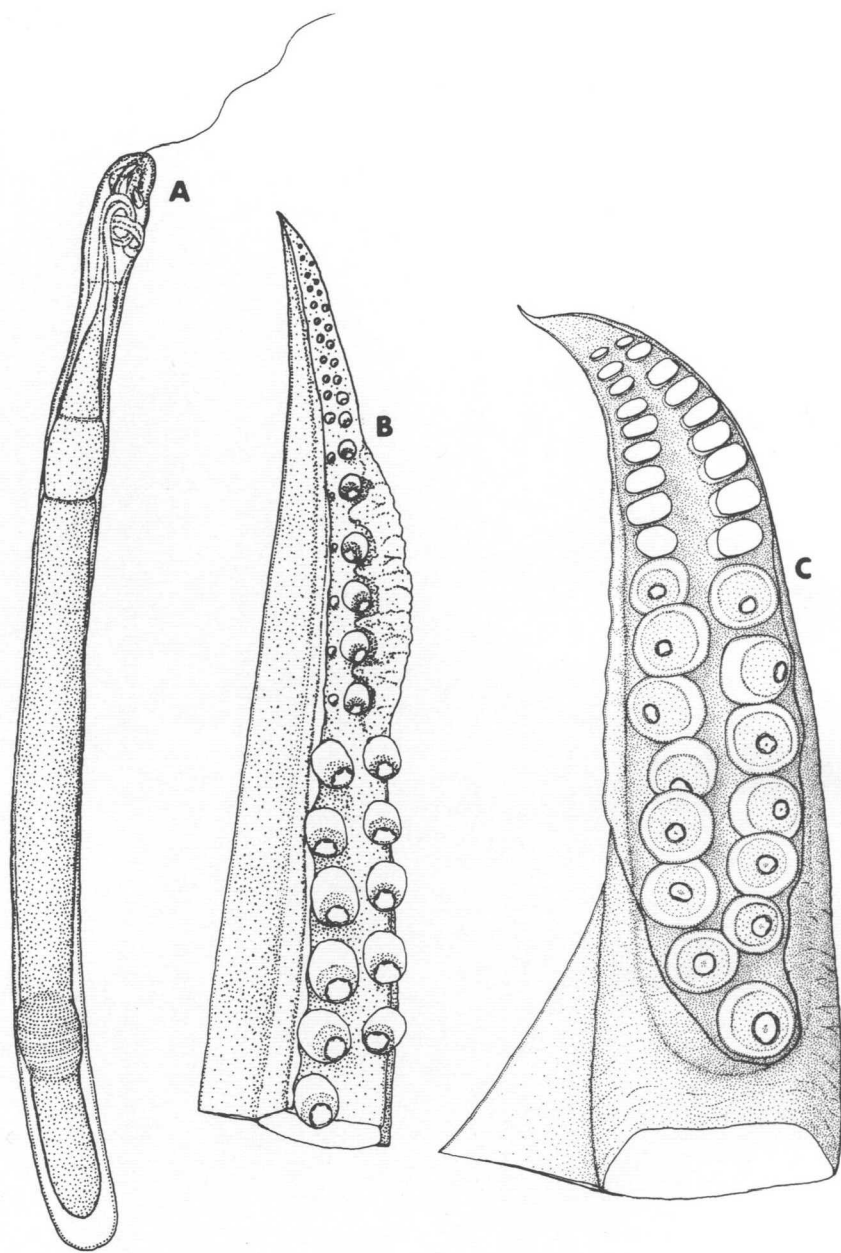


Figure 4. *Pickfordiateuthis pulchella*. A, spermatophore from male, ML 15.2 mm, UMML 31.1949; B, hectocotylus from same; C, *Pickfordiateuthis vossi* new species, hectocotylus from holotype, male, ML 13.6 mm, USNM 884276.

the manus, and gradually tapers to the tip. Club suckers have small, pointed teeth around the entire margin that are longest on the distal margin (Fig. 3A).

The left ventral arm is hectocotylized on the distal $\frac{1}{2}$ (HcL1, 40.9–47.6–56.0). Proximally there are about 5 rows of normal suckers. At about row 6, the suckers

Table 1. Measurements and indices of four male *Pickfordiateuthis pulchella*. a = UMML 31.1785, b = UMML 31.484, c = UMML 31.53, d = UMML 31.1949

	a	b	c	d
ML	12.4	12.6	14.9	15.2
MWI	46.0	42.1	34.2	38.2
HWI	46.8	54.8	37.6	40.8
FLI	43.5	51.6	34.9	48.0
FWI	71.8	92.9	69.1	78.3
ALI				
I	33.1	34.1	27.5	33.6
II	46.0	65.9	37.6	48.7
III	62.1	67.5	53.0	63.8
IV _r	49.2	59.5	46.3	46.7
IVI	52.4	55.6	44.3	49.3
HcLI	49.2	44.3	40.9	56.0
TLI	—	92.9	55.0	61.2
CLI	—	44.3	21.5	24.3

of the dorsal row become greatly reduced in size, and may be concealed by the dorsal protective membrane. Also at around row 6, a large puffy swelling that includes the ventral protective membrane originates on the ventral side of the arm and continues to around row 13. The suckers of the ventral row on this portion of the arm are partly enveloped by this swelling. Distally the suckers of both rows are normal in appearance (Fig. 4B).

The free rachis of the gladius is long, narrow, with straight borders; ending anteriorly in a blunt point. The anterior vane extensions are short and narrow. The vanes are broad, convex, with angular shoulders; vanes are widest near their midpoint, tapering posteriorly to a blunt terminal point (Fig. 1B).

The radula has 7 transverse rows of teeth (Fig. 3C). The lower beak has clear wings and lateral walls. The hood is very pale brown. The shoulder is pale brown in color, and no shoulder tooth is present. The lateral walls are not separated by a distinct crest, and have no notches or folds. Both beaks are illustrated (Fig. 1C, D).

Distribution.—Found in shallow water beds of sea grass from Miami, Florida to Panama, Nicaragua, Pedro Cays (17°N, 78°W, Caribbean), and Saint Martin (18°N, 63°W, Leeward Islands). Also known from Bonaire (Netherlands Antilles; Moonenbeek, 1985) and Sao Paulo, Brazil (M. Haimovici, pers. comm., 1988).

Holotype.—Female, ML 22.0 mm, USNM 574846.

Type Locality.—Old Rhodes Key, Florida, 25.2°N, 80.1°W, depth 3 m.

Remarks.—Existing collections indicate that this small squid commonly inhabits shallow waters in the vicinity of beds of sea grass, however, little is known about its life history and behavior. In live specimens (Fig. 2), chromatophores on the mantle characteristically form two distinct bands around the mantle. I have observed a similar chromatophore pattern on the mantles of some preserved specimens. As can be seen in Figure 2, the remainder of the mantle is transparent in live specimens, making the chromatophores on the visceral membrane clearly visible.

Voss (1953, 1956) described the hectocotylus of *P. pulchella* as having the suckers of the ventral row absent from the area of swelling to the tip of the arm. Examination of additional material clarifies the description in that both sucker

Table 2. Measurements and indices of 11 female *Pickfordiateuthis pulchella*. a = UMML 31.1784, b = UMML 31.623, c = UMML 31.1785, d = UMML 31.1784, e = UMML 31.515, f = UMML 31.1208, g = UMML 31.856, h = UMML 31.1952, i = UMML 31.2551, j = UMML 31.1947, k = UMML 31.1948

	a	b	c	d	e	f	g	h	i	j	k
ML	9.7	10.5	11.2	12.1	13.3	14.0	14.4	18.6	19.8	21.8	21.9
MWI	43.3	59.0	48.2	40.5	41.4	39.3	43.1	41.4	40.9	47.2	42.5
HWI	49.5	61.0	50.0	45.5	40.6	37.9	39.6	37.6	35.4	36.2	38.8
FLI	37.1	56.2	41.1	46.3	38.4	43.6	45.8	48.4	46.5	51.8	53.0
FWI	—	99.0	75.9	76.0	61.7	70.0	72.9	83.9	79.8	84.4	84.5
ALI											
I	35.1	56.2	21.4	26.6	33.1	29.3	34.7	30.1	27.3	34.4	40.6
II	53.6	81.9	31.3	40.5	48.9	39.3	60.4	45.7	46.0	43.1	46.6
III	66.0	92.4	47.3	52.9	52.6	—	63.2	51.1	50.5	54.6	53.9
IVr	54.6	89.5	41.1	59.5	49.6	—	54.2	45.2	45.5	45.4	46.1
IVI	58.8	91.4	38.4	51.2	46.6	34.3	56.3	42.5	48.0	45.9	47.5
TLI	99.0	196.2	84.8	75.2	—	52.1	122.2	57.0	85.9	81.7	88.1
CLI	34.0	44.8	29.5	21.5	—	23.6	43.0	26.9	24.7	22.9	30.1

rows are present; but those of the dorsal row are greatly reduced in size and those of the ventral row are partly embedded in the ventral swelling.

Pickfordiateuthis vossi new species
Figures 4C, 5–7

Material Examined.—Holotype: Male, ML 13.6 mm, Bahia Magdalena, B.C., Mexico, 24.6°N, 112.1°W, just north of Belcher's Point, 183 m offshore, 9 April 1955, USNM 884276. Paratypes: Female, ML 18.4 mm taken with holotype, UMML 31.2599; 1 Female, ML 13.2 mm, Los Frailes, B.C., Mexico, 23°21'N, 109°25'W, 24 March 1957, UMML 31.2598; 3 Males, ML 12.0–14.4 mm, 7 Females, ML 12.9–17.2 mm, R/V ALASKA Cruise 64A2 Sta. 49, Puerto Escondido, B.C., Mexico, 25°48'30"N, 111°18'42"W, depth 22.9 m, 14 April 1964, USNM 884277; 1 Male, 14.6 mm ML, R/V ALASKA Cruise 64A2 Sta. 49, Puerto Escondido, B.C., Mexico 25°48'30"N, 111°18'42"W, depth 22.9 m, 14 April 1964, UMML 31.2600; 1 Male, ML 10.5 mm, 2 Females, ML 14.4–15.8 mm, Bahia Magdalena, B.C., Mexico, 24.6°N, 112.1°W, Howland's Lagoon, off shore 275–550 m, 19 April 1955, USNM 884275.

Description.—The mantle is short, cylindrical and bluntly pointed posteriorly (Fig. 5A). Females are generally larger than males at maturity (ML, males 10.5–

Table 3. Ranges and means of *Pickfordiateuthis pulchella* (N = four males, 11 females)

Index	Males	Females
ML	12.4 - 13.8 - 15.2	9.7 - 15.2 - 21.9
MWI	34.2 - 40.1 - 46.0	39.3 - 44.3 - 59.0
HWI	37.6 - 45.0 - 54.8	35.4 - 42.9 - 61.0
FLI	34.9 - 44.5 - 51.6	37.1 - 46.2 - 56.2
FWI	69.1 - 78.0 - 92.9	61.7 - 78.8 - 99.0
ALI I	27.5 - 32.1 - 34.1	21.4 - 33.5 - 56.2
II	37.6 - 49.6 - 65.9	31.3 - 48.8 - 81.9
III	53.0 - 61.6 - 67.5	47.3 - 58.5 - 92.4
IVr	46.3 - 50.4 - 59.5	41.1 - 48.6 - 89.5
IVI	44.3 - 50.4 - 55.6	34.3 - 51.0 - 91.4
HcLI	40.9 - 47.6 - 56.0	—
TLI	55.0 - 69.7 - 92.9	52.1 - 94.2 - 196.2
CLI	21.5 - 30.0 - 44.3	22.9 - 30.1 - 44.8

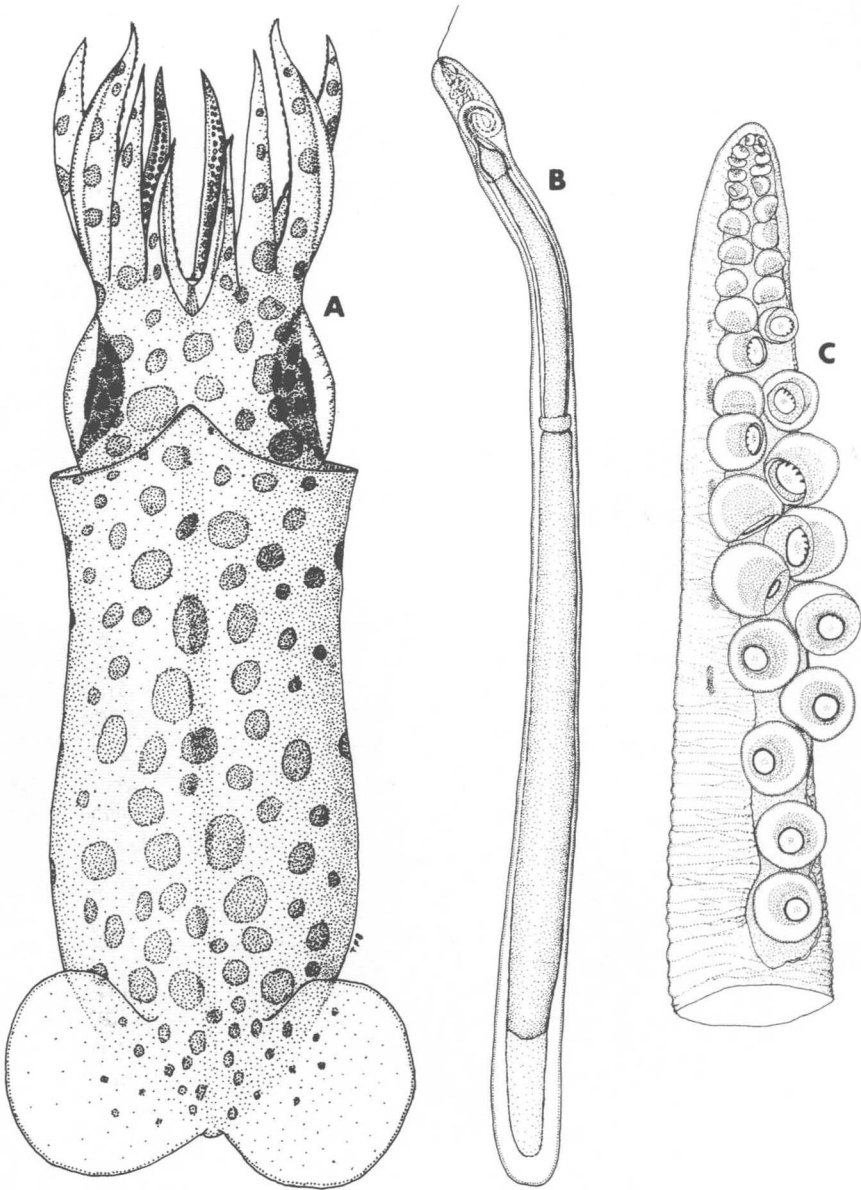


Figure 5. *Pickfordiateuthis vossi* new species. A, dorsal view of female, ML 13.2 mm, UMML 31.2598; B, spermatophore from holotype, male, ML 13.6 mm, USNM 884276; C, tentacular club from female, ML 13.2 mm, UMML 31.2598.

12.9–14.6 mm, females 12.0–15.1–18.4 mm). Mantle width is about $\frac{1}{3}$ to $\frac{1}{2}$ of the mantle length (MWI, males 40.2–45.3–55.2, females 34.2–43.0–52.8). The anterior margin is slightly flared, with a median, broad, pointed, dorsal lappet. The ventral margin is deeply indented ventral to the funnel.

The fins are large, round, their length about $\frac{1}{4}$ and their width about $\frac{1}{2}$ of the mantle length (FLI, males 27.0–28.8–31.7, females 27.8–30.0–33.3; FWI, males

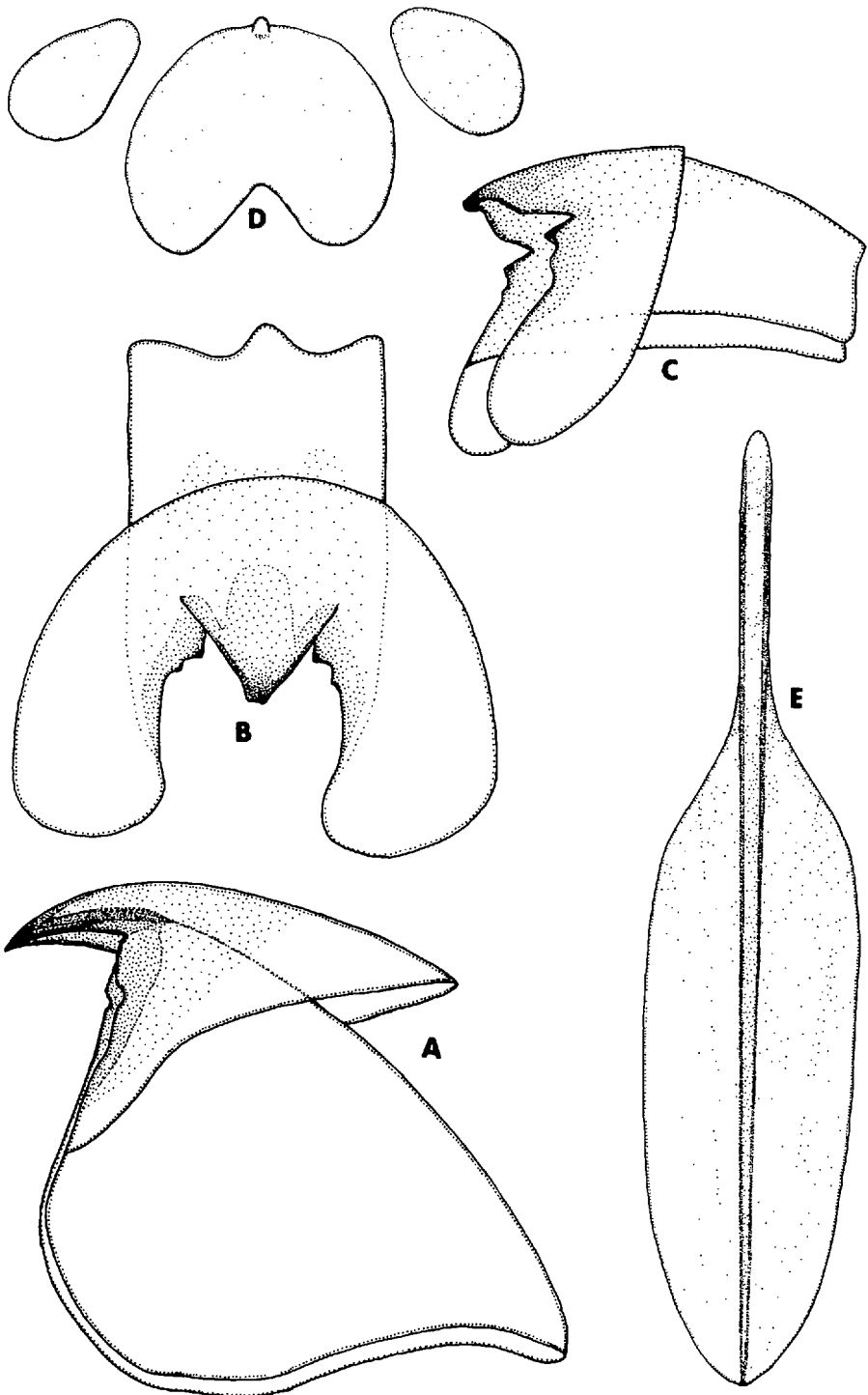


Figure 6. *Pickfordiateuthis vossi* new species. A, B, C, upper and lower beaks from female, ML 17.2 mm, USNM 884277; D, funnel organ from same; E, gladius from same.

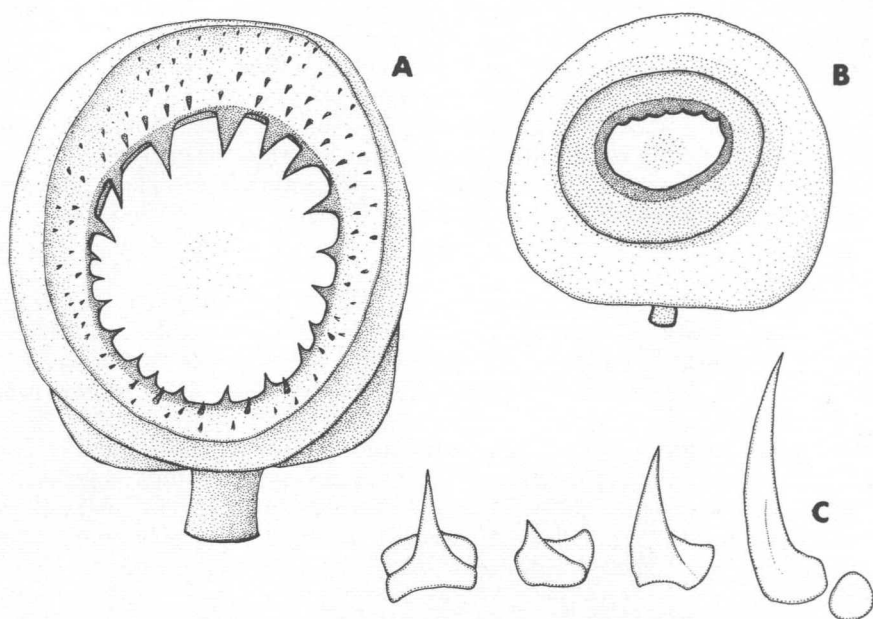


Figure 7. *Pickfordiateuthis vossi* new species. A, tentacular sucker from female, ML 18.4 mm, UMMML 31.2599; B, sucker from right arm III row 5 of same; C, radula from holotype, male, ML 13.6 mm, USNM 884276.

49.2–57.3–70.5, females 53.5–58.2–63.2). The posterior lobes of the fins extend beyond the posterior end of the mantle and are not united posteriorly.

Chromatophores are absent from the visceral membrane.

The head width is about $\frac{1}{3}$ of the mantle length, and is slightly narrower in females than in males (HWI, males 34.3–41.7–45.8, females 31.0–37.1–42.4). The funnel is short and stout. The funnel locking apparatus is simple and straight. The funnel organ has an inverted, U-shaped dorsal pad with broad lateral arms and a small, round, anterior apical papilla. The paired ventral pads are oval (Fig. 6D).

The buccal membrane has greatly reduced lobes, with 7 poorly developed supports, and no suckers. In females, spermatophores are implanted on a thickened spermatophore receptacle, which is found on the ventral portion of the buccal membrane. However, spermatophores are sometimes found scattered around the oral region. In mature females, the skin on the buccal membrane, the bases of the arms, and the area around the spermatophore receptacle is extremely wrinkled and somewhat swollen in appearance.

Spermatophores are small and thin, less than 2 mm in length (Fig. 5B). The cement body is slender, and occupies slightly more than $\frac{1}{4}$ of the spermatophore length. The spiral filament is fairly well developed. The sperm mass occupies slightly more than $\frac{1}{2}$ of the spermatophore length. The swelling seen on the spermatophores of *P. pulchella* is absent in *P. vossi*.

The arms are short, stout and in the order III.II \geq IV.I. All arms of mature males generally are longer than those of mature females (Table 6). Dorsal and ventral protective membranes border the sucker rows of all arms. The suckers are small and biserially arranged. The sucker rings have about 6 short, blunt teeth on

the distal margins; the proximal margins are smooth (Fig. 7B). The proximal suckers on arms II and III are enlarged in mature males.

The short tentacles are stout and highly modified, having the appearance of a fifth pair of arms (Fig. 5C). The tentacular stalks are greatly reduced and only slightly longer than the suckerless basal portions of the true arms. Tentacular clubs are greatly elongated, with no distinguishable carpus, manus, or dactylus. The first 2 or 3 suckers form a single longitudinal row, subsequently the suckers are arranged in 2 longitudinal rows to the distal club tip. The sucker rings have regularly spaced, pointed teeth around their entire margins, with those on the distal margin longest (Fig. 7A).

The left ventral arm is hectocotylized in males on the distal $\frac{1}{3}$ (HcLI, 25.5–31.2–35.6). About 6 to 9 pairs of normal suckers lie proximally, then the suckers of both rows disappear completely and their stalks are modified into long, thick papillae. These papillae decrease in size distally and are completely absent from the arm tip (Fig. 4C).

The free rachis of the gladius is long with straight convergent borders; it ends anteriorly in a blunt point. The anterior vane extensions are short, narrow and poorly demarcated from the rachis. The anterior vane shoulders are convex. The lateral vane borders are long and slightly convex. A slightly thickened band arises along the anterior vane shoulder and extends to the posterior tip of the gladius (Fig. 6E).

The radula has 7 transverse rows of teeth, and marginal plates are present (Fig. 7C). The lower beak has clear wings and lateral walls. The hood is very pale brown. The shoulder is pale brown in color, and a prominent shoulder tooth is present. The lateral walls are not separated by a distinct crest, and have no notches or folds. Both beaks are illustrated (Fig. 6A, B).

Distribution.—All specimens studied were taken in shallow water near the shore on the Pacific and Gulf coasts of Baja California, Mexico, between 23°21'N, 109°25'W and 25.5°N, 111.2°W. The actual range likely will be extended when larger collections become available.

Holotype.—Male, ML 13.6 mm, 24.6°N, 112.1°W, USNM 884276.

Type Locality.—Bahia Magdalena, B.C., Mexico, 24.6°N, 112.1°W, just north of Belcher's Point 183 m off shore.

Etymology.—This new myopsid squid was given the name *vossi* in honor of Dr. Gilbert L. Voss who has contributed so greatly to our knowledge of the Cephalopoda.

Remarks.—The modifications seen in the tentacles and beaks of *Pickfordiateuthis vossi* would seem to be related to feeding strategy, but observations made on living specimens will be needed before the ecology and behavior of these small squid can be understood.

Pickfordiateuthis species A Figures 8,9

Material Examined.—1 Female, ML 7.9 mm, R/V PILLSBURY Sta. 718, 11°22.5'N, 64°8.6'W, 20 July 1968, depth 60.4 m, UMML 31.1782; 1 Female, ML 8.7 mm, R/V PILLSBURY Sta. 698, 9°14'N, 59°42'W, 16 July 1968, depth 78.6 m, UMML 31.1781; 3 Females, ML 8.1–10.0 mm, R/V PILLSBURY Sta. 761, 11°52'N, 70°22'W, 27 July 1968, depth 54.9 m, UMML 31.1954; 1 Female, ML 11.9 mm, R/V PILLSBURY Sta. 619, 15°56'N, 87°34'W, 20 March 1968, UMML 31.1955; 1 Female, ML 9.3 mm, R/V PILLSBURY Sta. 837, 10°9.8'N, 60°34.3'W, 30 June 1969, depth 54.9 m, UMML 31.1783; 2

Table 4. Measurements (in mm) and indices of six male (the holotype and five paratypes) *Pickfordiateuthis vossi* new species, a = USNM 884275, b = USNM 884277, c = USNM 884277, d = USNM 884276 holotype, e = USNM 884277, f = UMML 31.2600

	a	b	c	d	e	f
ML	10.5	12.0	12.2	13.6	14.4	14.6
MWI	55.2	47.5	45.1	42.6	40.2	41.1
HWI	34.3	45.8	42.6	40.4	44.4	42.5
FLI	29.5	31.7	27.0	27.9	28.5	28.1
FWI	70.5	59.2	49.2	54.4	53.5	56.8
ALI						
I	26.7	26.7	25.4	19.9	22.2	25.3
II	41.9	38.3	37.7	27.9	32.6	37.0
III	43.8	46.7	38.5	34.6	38.2	41.8
IVr	—	37.5	36.9	25.7	31.9	33.6
IVI	41.9	37.5	33.6	27.9	31.9	32.2
HcLI	31.8	35.6	34.1	34.2	26.1	25.5
TLI	45.7	49.2	42.6	39.0	38.9	42.5
CLI	40.0	44.2	38.5	33.8	34.7	38.4

Females, ML 6.3–8.6 mm, R/V PILLSBURY Sta. 615, 16°1.5'N, 88°42.5'W, 19 March 1968, depth 12.8 m, UMML 31.1780.

Description.—The mantle (Fig. 8A) is short, stout, cylindrical and bluntly pointed posteriorly (ML, females 7.9–9.4–11.9 mm; the male is not known). Mantle width is about $\frac{2}{3}$ of the mantle length (MWI, 55.0–63.5–81.0). The anterior margin is wide, slightly flared, with a median, broad, rounded dorsal lappet marking the anterior end of the gladius. The ventral margin is deeply indented ventral to the funnel.

Fins are large, round, their length a little over $\frac{1}{2}$, and their width generally greater than the mantle length (FLI, 43.0–55.2–69.6; FWI, 88.0–109.6–132.9). The posterior lobes of the fins extend beyond the posterior end of the mantle and are not united posteriorly.

Chromatophores present on the visceral membrane.

Head width about $\frac{2}{3}$ of the mantle length (HWI, 60.0–65.9–75.9). The funnel is short and stout. The funnel locking apparatus is simple and straight. The funnel

Table 5. Measurements (in mm) and indices of 11 female paratypes of *Pickfordiateuthis vossi* new species, a = USNM 884277, b = UMML 31.2598, c = USNM 884277, d = USNM 884277, e = USNM 884275, f = USNM 884277, g = USNM 884277, h = USNM 884277, i = USNM 884275, j = USNM 884277, k = UMML 31.2599

	a	b	c	d	e	f	g	h	i	j	k
ML	12.9	13.2	14.4	14.4	14.4	14.6	15.1	15.5	15.8	17.2	18.4
MWI	45.0	40.2	44.4	52.8	43.1	43.2	42.4	42.6	41.8	43.0	34.2
HWI	41.1	36.4	36.1	33.3	36.8	39.7	37.7	42.4	36.7	37.2	31.0
FLI	27.9	28.8	27.8	33.3	28.5	—	29.8	31.0	—	32.0	31.0
FWI	53.5	54.5	54.9	—	56.3	—	62.9	63.2	—	62.8	57.1
ALI											
I	24.8	21.2	24.3	15.3	20.1	24.0	27.2	23.9	22.2	—	13.0
II	34.9	31.8	34.7	25.7	31.3	30.1	33.8	31.6	32.9	29.7	25.0
III	39.5	34.1	35.4	36.1	34.0	34.9	40.4	36.1	40.5	32.6	27.7
IVr	31.8	26.5	30.6	27.1	27.1	30.8	31.1	32.3	31.6	—	21.7
IVI	32.6	28.8	29.2	27.8	26.4	28.8	31.8	31.6	33.3	26.2	—
TLI	41.1	31.8	37.5	38.9	35.4	34.9	38.4	38.1	43.7	33.1	30.9
CLI	36.4	27.3	32.6	34.7	33.3	32.2	33.8	35.5	41.1	30.8	26.1

Table 6. Ranges and means of *Pickfordiateuthis vossi*, new species (N = six males, 11 females)

Index	Males	Females
ML	10.5 - 12.9 - 14.6	12.9 - 15.1 - 18.4
MWI	40.2 - 45.3 - 55.2	34.2 - 43.0 - 52.8
HWI	34.3 - 41.7 - 45.8	31.0 - 37.1 - 42.4
FLI	27.0 - 28.8 - 31.7	27.8 - 30.0 - 33.3
FWI	49.2 - 57.3 - 70.5	53.5 - 58.2 - 63.2
ALI I	19.9 - 24.4 - 26.7	13.0 - 21.6 - 27.2
II	27.9 - 35.9 - 41.9	25.0 - 30.9 - 34.9
III	34.6 - 40.6 - 46.7	27.7 - 35.6 - 40.5
IVr	25.7 - 33.1 - 37.5	21.7 - 29.1 - 32.3
IVI	27.9 - 34.2 - 41.9	26.2 - 29.7 - 33.3
HeLI	25.5 - 31.2 - 35.6	—
TLI	39.0 - 43.0 - 49.2	30.9 - 36.7 - 43.7
CLI	33.8 - 38.3 - 44.2	26.1 - 33.1 - 41.1

organ has an inverted, U-shaped dorsal pad with narrow lateral arms and a small, round apical papilla. The paired ventral pads are oval (Fig. 9C).

The buccal membrane has greatly reduced lobes, with 7 poorly developed supports, and no suckers. Females have a thickened spermatophore receptacle on the ventral portion of the buccal membrane, but no attached spermatophores were found on the specimens examined.

The spermatophores and hectocotylus are unknown.

The arms are short and stout and in the order III.IV.II.I. Dorsal and ventral protective membranes border the sucker rows of all arms. Suckers are small and biserially arranged. In some of the largest, best-preserved specimens, 2 or 3 small, short, blunt teeth can be found on the largest suckers, but most arm suckers appear to lack teeth.

Tentacles are very long and slender. The clubs are compact and narrow, bordered dorsally by a swimming membrane. There is no distinguishable carpus. The manus of the club has 2 rows of large suckers, changing distally to 4 rows on the dactylus (Fig. 9D). Dactylus is short, about $\frac{1}{3}$ the length of the manus and distally narrows rapidly to a point. Club suckers have small, pointed teeth around the entire margin, which are longest on the distal side (Fig. 9E).

The free rachis of the gladius is long, narrow, with straight borders; ending anteriorly in a blunt point. The anterior vane extensions are short and narrow. Vanes broad, convex, with angular shoulders; tapering posteriorly to a blunt terminal point (Fig. 8B).

The radula has 7 transverse rows of teeth, and marginal plates are present (Fig. 8C). The lower beak has clear wings and lateral walls. The hood is very pale brown. The shoulder is pale brown in color, and no shoulder tooth is present. The lateral walls are not separated by a distinct crest, and have no notches or folds. Both beaks have been illustrated (Fig. 9A, B).

Distribution.—Known from the Gulf of Honduras 16°1.5'N, 88°42.5'W to Guyana 10°9.8'N, 60°34.3'W.

Remarks.—While examining the cephalopod collections of the Marine Invertebrate Museum, University of Miami, I came across some specimens from the western North Atlantic whose characteristics placed them in the genus *Pickfordiateuthis*, but they differed significantly from *pulchella*, the only known species from this area. The general body shape is stouter, the tentacles longer, and the general shape of the clubs differs from that of *pulchella* (Figs. 3E, 9D). Some

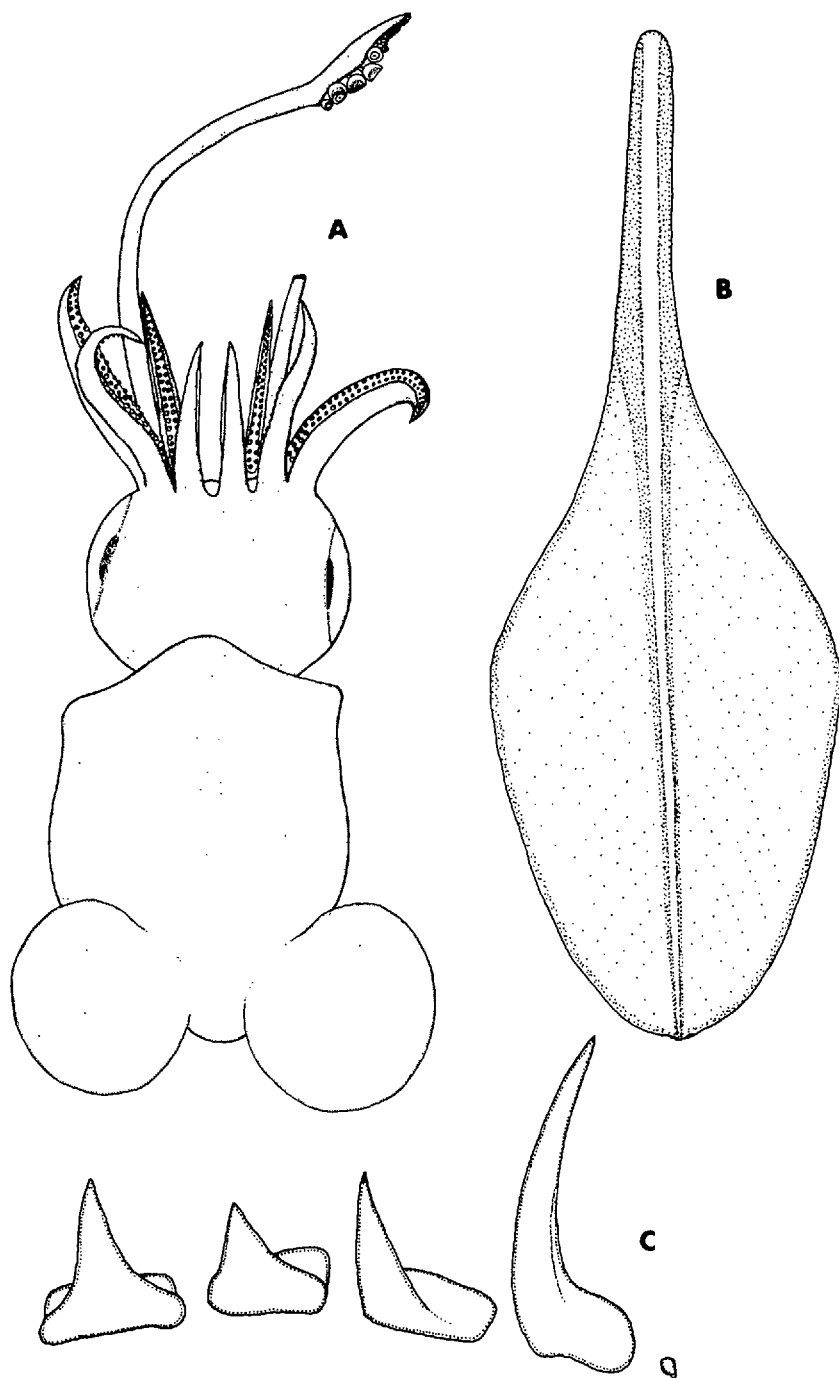


Figure 8. *Pickfordiateuthis* species A. A, dorsal view of female, ML 10.0 mm, UMML 31.1954; B, gladius from female, ML 11.9 mm, UMML 31.1995; C, radula from female, ML 10.0 mm, UMML 31.1954.

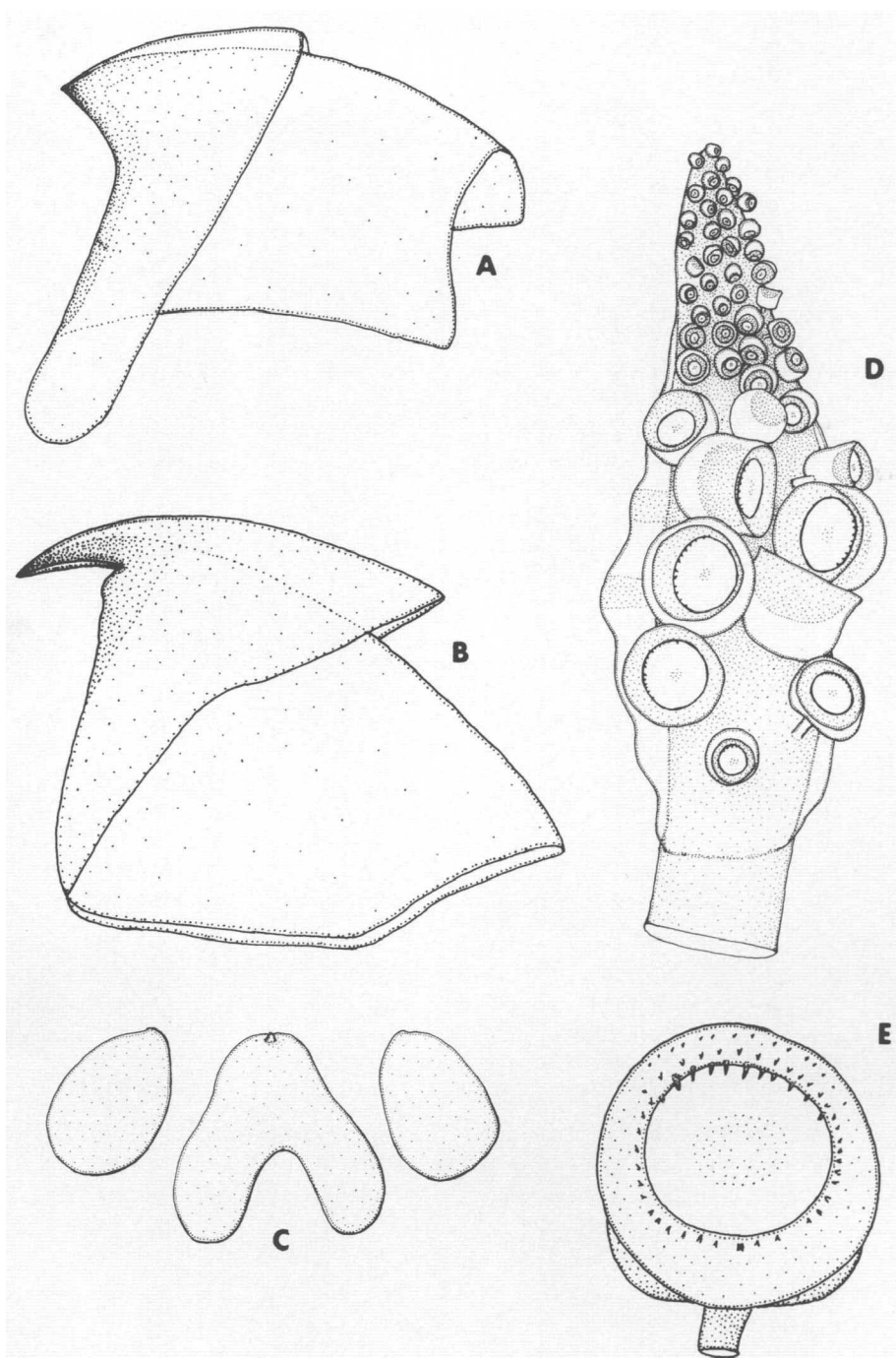


Figure 9. *Pickfordiateuthis* species A. A, B, lower and upper beaks from female, ML 10.0 mm, UMML 31.1954; C, funnel organ from female, ML 8.7 mm, UMML 31.1781; D, tentacular club from female, ML 10.0 mm, UMML 31.1954; E, large tentacular sucker from same.

Table 7. Measurements (in mm) and indices of seven female *Pickfordiateuthis* species A, a = UMML 31.1782, b = UMML 31.1954, c = UMML 31.1781, d = UMML 31.1783, e = UMML 31.1954, f = UMML 31.1954, g = UMML 31.1955

	a	b	c	d	e	f	g
ML	7.9	8.1	8.7	9.3	9.6	10.0	11.9
MWI	81.0	56.8	66.7	57.0	69.8	55.0	58.8
HWI	75.9	66.7	65.5	69.9	62.5	60.0	60.5
FLI	69.6	69.1	51.7	46.2	60.4	43.0	46.2
FWI	132.9	107.4	121.8	95.7	124.0	88.0	97.5
ALI I	40.5	55.6	35.6	—	36.5	35.0	42.0
II	67.1	66.7	48.3	—	59.4	58.0	52.1
III	86.1	86.4	59.8	—	70.8	78.0	70.6
IVr	—	69.1	65.5	—	60.4	59.0	64.7
IVI	73.4	70.4	58.6	—	59.4	56.0	70.6
TLI	—	129.6	132.2	—	152.3	157.0	152.1
CLI	—	38.3	32.1	—	33.3	31.0	35.3

specimens were found to have chromatophores on the visceral membrane, but, due to the poor condition of the specimens no chromatophore patterns could be clearly discerned here or on the mantle. The proximal suckers on the manus of the tentacular clubs are in 2 rows, however, they are much larger than those of *pulchella*. Unfortunately, I was only able to locate nine specimens, all of which were females (most were mature, with eggs) and most of which were in relatively poor condition. These specimens may represent a new species, but show some variations, which suggest that they could be a subspecies of *pulchella*. The body shape in some specimens approaches that of *P. pulchella* and in these the proximal suckers on the tentacular clubs show a lesser degree of enlargement. With the small number of specimens, and little ecological data, it is difficult to relate these variations to geographic range or habitat. Because of this uncertainty, and the lack of male specimens, I have decided not to name these specimens as a new species. Hopefully, more specimens, including mature males, will become available and clarify the taxonomic position of these interesting little squids.

Discussion.—The characters that have been used to distinguish the *Pickfordiateuthidae* from the *Loliginidae* are: elliptical to round, sepiolid-like fins not connected posteriorly; visceral membrane covered with numerous chromatophores; and the manus of the tentacular club with 2 rows of suckers. It can be seen in Toll's 1982 work that the gladius of *Pickfordiateuthis* with its broad rounded vanes differs

Table 8. Ranges and means of seven female *Pickfordiateuthis* species A

Index	\bar{x}
ML	7.9 - 9.4 - 11.9
MWI	55.0 - 63.5 - 81.0
HWI	60.0 - 65.9 - 75.9
FLI	43.0 - 55.2 - 69.6
FWI	88.0 - 109.6 - 132.9
ALI I	35.0 - 40.9 - 55.6
II	48.3 - 58.6 - 67.1
III	70.6 - 75.2 - 86.4
IVr	59.0 - 63.7 - 69.1
IVI	56.0 - 64.7 - 73.4
TLI	129.6 - 144.6 - 157.0
CLI	31.0 - 34.0 - 38.3

from that of known loliginids, however, as Toll noted, "There is a wide range of variation in the shape of the loliginid gladius." Brakoniecki (1986) noted that the morphology of the hectocotylus of *pulchella* differs from those seen in the Loliginidae; and Hess (1987) indicated that the spiral filament in the spermatophores of *pulchella* is not as well developed as that of other known myopsids.

While the new species *vossi* does have round, sepiolid-like fins, it lacks most of the other major characteristics of the family Pickfordiateuthidae. *P. vossi* has no chromatophores on the visceral membrane. The tentacular clubs of *vossi* have 2 rows of suckers for most of their length, however, it is difficult to determine the exact relationship between these highly modified, arm-like tentacles and the 2 rows of suckers seen on the distinct manus of the tentacular clubs of *pulchella* (Figs. 3E, 5C). While the hectocotylus of *pulchella* (Fig. 4B) differs from those of other myopsids, it is closest morphologically to the hectocotylus Type V (Brakoniecki, 1986) of some western Atlantic loliginids such as *Doryteuthis pealei*. The hectocotylus of *vossi* (Fig. 4C), on the other hand, resembles those of several other myopsids (*Loligo vulgaris*, *Afrololigo mercatoris*, *Photololigo bartschi*, *Allotheuthis* spp.) and fits into the ancestral Type I hectocotylus group discussed by Brakoniecki (1986). The spermatophores and gladius of *vossi* differ notably from those of *pulchella* and resemble those of the small, eastern Pacific species *Lolliguncula argus* Brakoniecki and Roper, 1985. These similarities between *vossi* and some members of the Loliginidae combined with the absence of most of the major characters of the Pickfordiateuthidae draws into question the validity of the latter family. With the description of *vossi*, the only character that clearly separates the Pickfordiateuthidae from the Loliginidae is the presence of elliptical to round fins that are separate posteriorly. Loliginids are known to pass through developmental stages in which the fins are not united posteriorly (Naef, 1921/23; Hanlon, 1978; Hanlon et al., 1992). Since I do not consider fin shape alone to be sufficient justification for a separate family, I consider Pickfordiateuthidae Voss, 1953 to be a junior synonym of the family Loliginidae (Lesueur, 1821), and place the genus *Pickfordiateuthis* Voss, 1953 into the family Loliginidae.

The extreme modifications seen in *P. pulchella* and *vossi* make the exact evolutionary relationship between the taxa difficult to determine. The fins of *vossi* place it in the genus *Pickfordiateuthis*, and its eastern Pacific distribution seems to suggest a sibling relationship with *pulchella*. In other marine invertebrate groups, closely related species occur on the Atlantic and Pacific coasts of the Central American isthmus, and this generally has been associated with the various openings and closings of Central America that have occurred in the geologic past. For example, Mayer (1954) proposed such a speciation pattern in the tropical echinoid genus *Eucidaris*, and Brakoniecki (1986) and Voight (1988, 1990) noted similar patterns in the loliginid genus *Lolliguncula* and the octopodid genus *Octopus*, respectively. However, the information needed to understand the relationships within the genus *Lolliguncula* was not available until the males of *L. panamensis* were fully described (Brakoniecki, 1980, 1986) and the species *L. argus* Brakoniecki and Roper (1985) was described. If other currently unknown species of *Pickfordiateuthis* exist in the Atlantic and (or) Pacific Oceans, their discovery might contribute the morphological information needed to understand the relationships within this genus. At present evidence exists of two undescribed species of *Pickfordiateuthis* and more may exist, because all known members of the genus are small, shallow-water species that are seldom collected by large, off shore research vessels and, if caught, could easily be damaged during collection or mistaken for larvae. For example, all of the specimens of *Pickfordiateuthis* species A were found in jars labeled "cephalopod larvae" in the unaccessioned collec-

tions of the Marine Invertebrate Museum, University of Miami. In addition to this unnamed taxon, at least one other species of *Pickfordiateuthis* exists in the tropical western Atlantic that currently is being described (M. Vecchione and C. F. E. Roper, pers. comm.).

KEY TO THE SPECIES OF *PICKFORDIATEUTHIS* VOSS, 1953

- 1a. West Atlantic myopsid teuthoids with elliptical to round fins that are separate posteriorly in adults; chromatophores present on the visceral membrane; 2 rows of suckers on manus of tentacular clubs, 4 rows distally on the dactylus 2
- 1b. East Pacific myopsid teuthoid with round fins that are separate posteriorly in adults; no chromatophores on the visceral membrane; tentacular clubs highly modified, arm-like, with no visible manus or dactylus; the proximal suckers on the tentacular clubs in a single row, increasing to 2 rows on the remaining club length *P. vossi*
- 2a. Fins round to elliptical, suckers on manus of tentacular clubs not noticeably enlarged, dactylus of club moderately long, about equal to length of manus, tapers gradually to tip *P. pulchella*
- 2b. Fins round, suckers on manus of tentacular clubs enlarged, dactylus of club short, about $\frac{3}{4}$ length of manus, tapers abruptly to tip *P. sp. A*

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